35. [Amended] An integrated circuit compatible with a plurality of phone line standards having hookswitch transition requirements, the integrated circuit comprising:

a13

a node carrying a hookswitch signal; and

at least one current control circuit coupled to the node to receive the hookswitch signal, the current control circuit coupled to at least one output of the integrated circuit, the current control circuit operating prior to the completion of a hookswitch transition to enable a decrease in a current level drawn from the phone line.

36. The integrated circuit of claim 35, further comprising a plurality of the current control circuits.

37. The integrated circuit of claim 36, the at least one output being coupled to hookswitch circuitry.

REMARKS

The Office Action has rejected claims 1-24 and 35-37. Claims 25-34 were indicated to be allowable. Claims 1-37 remain pending.

Drawing Objections

Drawing corrections are submitted herewith addressing the request to label Figures 1, 1A and 1B as prior art. Formal drawings are also submitted including the correction requested.

Specification Objections

The amendments provided herein to the specification address the objections raised in the Office Action.

Claim Rejections – 35 U.S.C. §112

Independent claims 1, 10, 15, 18, 19, 24 and 35 have been amended to address the rejections under 35 U.S.C. §112.

Claim Rejections – Prior Art

Claims 1-17 were rejected over prior art. Claims 24-34 were indicated to be allowable (claims 35-37 were only rejected under 35 U.S.C. §112). It is therefore respectfully asserted that claims 24-37 as amended to address the 35 U.S.C. §112 rejection are allowable.

Moreover, it is respectfully asserted that claims 1-17 are in condition for allowance as it is asserted that independent claims 1 and 10 are patentably distinct from the cited art. In particular, it is noted that claims 1 and 10 are directed to telephone line hookswitches. Hookswitches are known in the telephone line interface to be the switches that "seize" the phone line to establish a connection to the phone line. The combinations asserted in the Office Action combine telephone line interface references that refer to hookswitch applications with generic current control references (Borle and Clemo). It is noted however, that there is no suggestion or teaching in any of the references to utilize such switching control circuits in a phone line hookswitch application. In addition, there is no suggestion or teaching to provide a combination that specifically controls a switch in response to a signal indicative of a hookswitch state or transition. It is noted that as amended the claims more clearly call out the relationship of the claimed invention to phone line hookswitch circuitry. In addition, it is noted that as amended claim 1 now includes language more similar to allowed claim 35 with regard to the current control circuitry. Likewise as amended claim 10 now includes language more similar to allowed claim 25 with regard to the adjusting downward step.

Thus, it is respectfully submitted that independent claims 1 and 10 (and claims 2-9 and 11-17 depending therefrom) are in condition for allowance.

CONCLUSION

In view of the foregoing, it is submitted that the claims are in condition for allowance. Accordingly, favorable reconsideration and Notice of Allowance are courteously solicited.

A petition for extension of time and a check for the appropriate fee are enclosed herewith. However, if an additional extension is deemed to be needed, please consider this paper to be a request for such extension and deduct any required fee from deposit account 10-1205/SILA:045.

Should any fees under 37 CFR 1.16-1.21 be required for any reason relating to the enclosed materials, the Commissioner is authorized to deduct such fees from Deposit Account No. 10-1205/SILA:045. The examiner is invited to contact the undersigned at the phone number indicated below with any questions or comments, or to otherwise facilitate expeditious and compact prosecution of the application.

Respectfully submitted,

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APPENDIX
MARKED UP VERSION OF AMENDMENTS AS REQUIRED BY RULE 121

In the Specification:

On page 2, please replace the paragraph from lines 11-15 with the following:

As mentioned above, the telephone interface requirements generally include specifications for the pulse dialing (also called decadic dialing) transitions and spark quenching presented to the telephone line. In general, pulse dialing comprises a repetitive series of on-hook and off-hook transitions. Figure 1 shows the standard two-wire public network lines, the TIP line 8 and the RING line 6 [8]. The TIP line and the RING line may be conventionally connected to a diode bridge 11. The diode bridge presents the proper polarity line signal to the hookswitch circuit 12 independent of the TIP and RING polarity. The hookswitch circuit 12 operates as a switch to "seize" or "collapse" the TIP and RING phone lines to allow the maximum loop current (I_{loop}) that is available from the phone line to flow. In an on-hook condition (i.e. the user is not transmitting data to or from the phone line), the hookswitch circuit 12 may be switched open. In an off-hook condition, the hookswitch circuit 12 may be switched closed to allow a loop current flow I_{LOOP}. The remaining DAA circuitry is shown as block 10. The phone company exchange is connected to the other side of the TIP and RING lines and may be characterized as a voltage source 16, an inductor 14 have an inductance L and a resistor 13. As the hookswitch opens and closes, the loop current flow I_{LOOP} will change and the voltage across the inductor 14 will change.

On page 6, please replace the paragraphs from lines 22-26.

[Figure 2A is a block diagram of a telephone set illustrating a typical application of the present invention.

Figure 2 is a general block diagram of digital DAA circuitry including phone line side circuitry, an isolation barrier, and powered side circuitry according to the present invention.]

--Figure 2 is a general block diagram of digital DAA circuitry including phone line side circuitry, an isolation barrier, and powered side circuitry according to the present invention.

Figure 2A is a block diagram of a telephone set illustrating a typical application of the present invention.--

On page 7, please replace the paragraphs from lines 1-4 with the following:

Figures 4A, 4B and 4C are [4 is a] general circuit diagrams of digital DAA circuitry implemented with two integrated circuits (ICs), a capacitive isolation barrier, and external circuitry according to the present invention.

Figure 5 is a conceptual [conceptually] diagram of a circuit according to the present invention.

On page 17, please replace the paragraphs from lines 4-7 with the following:

The current through current source 502 does not have to be completely ramped down prior to the opening of the hookswitch 500. Rather, the current need only be dropped to a level sufficiently low so that the current change (di/dt) when the hookswitch 500 opens does not exceed a level that results in the failure to meet pulse dialing and spark quenching specifications.

On page 17, please replace the paragraph beginning on line 18 with the following:

Example circuitry for achieving a current ramp when transition from off-hook to on-hook conditions in shown in Figure 6. Figure 6 illustrates the phone line side DAA integrated circuit 1802B and the surrounding external hookswitch circuitry using the same nomenclature and circuit connections as shown in Figure 4. As seen in Figure 6 [8], the TIP and RING lines are provided to the diode bridge 1820. The diode bridge is coupled to the phone line side DAA integrated circuit 1802B through the hookswitch circuitry which includes transistors Q1, Q2, Q3

and Q4 and associated resistors. The hookswitch circuitry shown herein is merely exemplary, and many other hookswitch circuits may utilize the techniques of the present invention. The phone line side DAA integrated circuit 1802B is indicated by the dashed line and includes input/output pins QE, QB, QE2, IGND, FILT, FILT2 and REF. The DAA integrated circuit 1802B includes an I_{HOOK} current source 600, an I_{DCT}' current source 604, an I_{CHIP} current source 606 and an I_{QB} current source [604]. The current I_{HOOK} operates to control the activation of transistor Q2. When the current I_{HOOK} is zero the hookswitch is in an on-hook state and transistor Q2 is off. When the current I_{HOOK} is on, transistor Q2 is activated and current flows through Q2. When the current I_{HOOK} is large enough (for example approximately 4 mA), transistor Q2 is in saturation and the hookswitch is in the off-hook mode. During off-hook conditions, the loop current is the sum of the currents I_{HOOK}, I_{DCT}, I_{DCT}', I_{QB}, and I_{CHIP}. As will be described below, the current I_{DCT}' is created by current mirroring (32X) the current I_{DCT}. In off-hook conditions, I_{QB} is similar in magnitude to the current I_{DCT}. The current I_{CHIP} represents all other currents drawn on chip. The I_{HOOK} current is related to the currents I_{DCT}, I_{DCT}', and I_{QB} as described below in more detail.

On page 18, please replace the paragraph beginning on line 18 with the followingr:

Circuitry for ramping down the currents I_{DCT}', I_{CHIP}, and I_{HOOK} may <u>be</u> seen with respect to Figures 7, 8, and 9 respectively. As shown in Figure 7, the current I_{DCT}' may be generated by use of current mirror transistors 706, 705, and 708 which are sized to provide a current I_{DCT}' that is 32 times the current I_{DCT}. During off-hook operation the switch 704 is closed and the switch 702 is opened. Connected to switch 704 is a large resistance resistor 712 (2 MΩ) and connected to switch 702 is a smaller resistance resistor 714 (400 KΩ). Switch 704 is connected to the FILT pin of the phone line side DAA integrated circuit 1802B and switch 702 is coupled between the FILT pin and the QE2 pin as shown. A diode connected transistor 720 may be connected to the resistor 714 as shown. Coupled between the FILT pin and the QE2 pin is an external capacitor C12. As shown in Table 1, C12 may have a capacitance of 0.22 uF. As mentioned above, in the steady-state off-hook operation switch 702 is open and 704 is closed. This provides a path to the gate of transistor 708 to generate the 32X mirror current through transistor 708. When a transition to an on-hook state is signaled to switches 704 and 702 (such as for example by an on-

hook control signal 504 as shown in Figure 5), switch 704 is opened and switch 702 is closed. This will result in a change in the gate voltage of transistor 708 (and thus correspondingly the current I_{DCT}') that is dependent upon the time constant of the internal resistor 714 and the external capacitor C12. The di/dt of the current I_{DCT}' is therefore affected by the values chosen for the resistor 714, transistor 720 and the capacitor C12.

On page 19, please replace the paragraph at lines 5-21 with the following:

Similarly, the I_{CHIP} may be ramped down as shown in Figure 8. As shown in Figure 8, a Vc supply voltage level is provided to the phone line side DAA integrated circuit 1802B at the QE2 pin. Coupled between the FILT2 pin and the QE2 pin is an external capacitor <u>C13</u> [C12] (for example 0.47 uf as shown in Table 1). Coupled to Vc is a plurality of p-channel chip bias transistors 802 which provide bias currents to the various circuits of the phone line side DAA integrated circuit 1802B. These bias currents together result in the current I_{CHIP}. During off-hook operation, the switch 806 is closed and the switch 804 is opened. Coupled to switch 806 is an internal resistor 808 (for example 500 KΩ) and coupled to switch 804 is an internal resistor 810 (for example 400 KΩ). A diode connected transistor is connected to resistor 810 as shown. The voltage applied through switch 806 to the gates of transistors 802 when the circuitry is in an off-hook mode is generated with a differential amplifier 814 having a bandgap voltage of 1.25 V and the REF pin voltage as its two inputs as shown. In off-hook operation, the switch 806 is closed and the switch 804 is opened. When a transition to on-hook operation is desired (for example as signaled by the on-hook control signal 504), the switch 806 opens and the switch 804 closes. This will result in transistors 802 to begin to turn off and the current I_{CHIP} will begin to ramp down. The speed at which the transistors will turn off and the current ramps down will be dependent upon the time constant of external capacitor C13, transistor 820, and the internal resistor 810. The di/dt of the current I_{CHIP} is therefore affected by the values chosen for the resistor 714 and the capacitor C12.

In The Claims:

1. [Amended] A communication system, comprising:

phone line side circuitry that [may be] is capable of being coupled to phone lines;

powered side circuitry that [may be] is capable of being coupled to the phone line side circuitry through an isolation barrier;

a hookswitch transition node carrying a hookswitch transition signal indicative of a desire to change a hookswitch within the phone line side circuitry from an off-hook state to an on-hook state; and

current [ramping] control circuitry coupled to the hookswitch transition [signal] node within the phone line side circuitry, the current [ramping] control circuitry [ramping downward the current drawn from the phone line in response to the hookswitch transition signal prior to the hookswitch completely changing states] operating prior to the completion of a hookswitch transition to enable a decrease in a current level drawn from the phone line in response to the hookswitch transistion signal.

10. [Amended] A method of operating a communication system that [may be] is capable of being coupled to a phone line, comprising:

coupling an isolation barrier between powered circuitry and phone line side circuitry;

drawing current at a first current level from the phone line through the hookswitch circuitry;

providing hookswitch circuitry within the phone line side circuitry, the hookswitch circuitry setting the communication system in a phone line off-hook state or a phone line on-hook state; and

[decreasing] adjusting downward the current drawn through the hookswitch to a second level in response to a signal indicative of a desired state of the hookswitch circuitry prior to changing the hookswitch from an off-hook state to an on-hook state, the second current level being less than the first current level.

15. [Amended] The method of claim 14, the current being [decreased] adjusted downward while the hookswitch begins to change states.

18. [Amended] A hookswitch transition circuit within a communication system that [may be] is capable of being connected to phone lines, the hookswitch transition circuit comprising:

a hookswitch control node carrying a hookswitch control signal; and

at least one variable current circuit coupled to the hookswitch control [signal] node, the at least one variable current circuit responsive to the hookswitch control signal to decrease a current drawn from the phone lines prior to changing the state of a hookswitch.

19. [Amended] The hookswitch transition circuit of claim 18, the at least one variable current circuit comprises at least two variable current circuits, each coupled to the hookswitch control [signal] node.

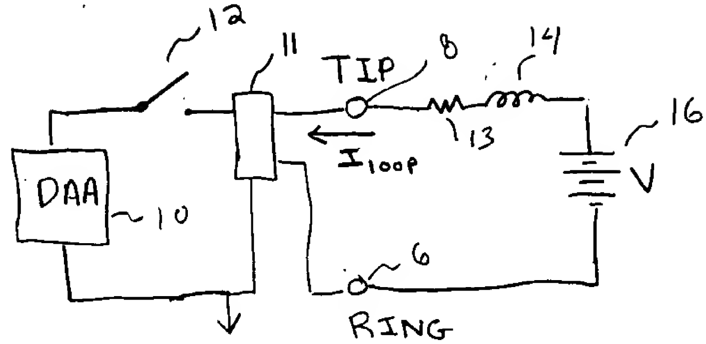
24. [Amended] The hookswitch transition circuitry of claim 18, further comprising at least one switch coupled to the hookswitch control [signal] node within a phone line side DAA integrated circuit.

35. [Amended] An integrated circuit compatible with a plurality of phone line standards having hookswitch transition requirements, the integrated circuit comprising:

a node carrying a hookswitch signal; and

at least one current control circuit coupled to the node to receive the hookswitch signal, the current control circuit coupled to at least one output of the integrated circuit, the current control circuit operating prior to the completion of a hookswitch transition to enable a decrease in a current level [on the phone] drawn from the phone line.

Fig. 1
Prior Art



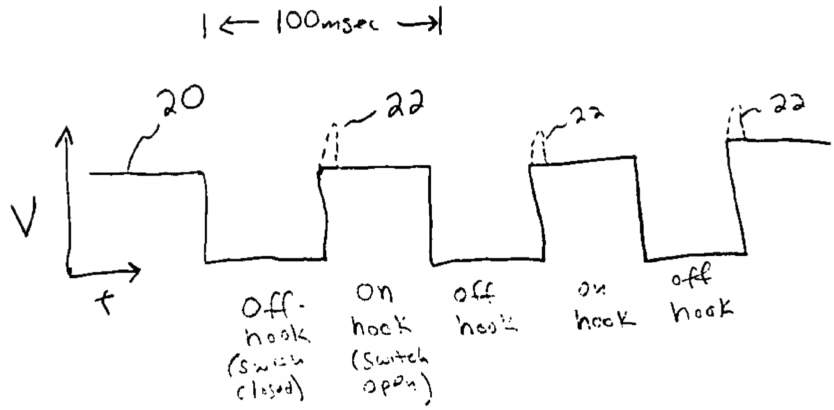


Fig 1A
Prior Art

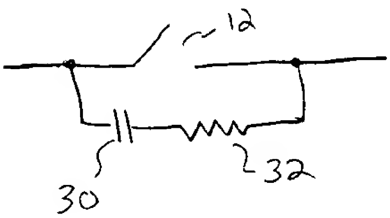


Fig 1B
Prior Art